REMARKS

The Applicants sincerely appreciate the thorough examination of the present application as evidenced by the Office Actions of December 1, 2004, and April 7, 2005. In particular, the Applicants appreciate the indication that Claims 3-4, 8, 14-15, 20-22, 25-26, 30-32, 39, 41-43, 46-47, 51-53, 56-57, 61, and 63-64 would be allowable if rewritten in independent form. These claims have not been rewritten in independent form because the Applicants will show in the following remarks that the independent claims are patentable over the cited art. The Applicants also appreciate the withdrawal of all rejections under 35 U.S.C. Sec. 112, and all rejections based on the Hochberg reference.

The Applicants further appreciate all courtesies extended by the Examiner in the telephonic interview of May 23, 2005. In particular, the telephonic interview related to the portions of the Final Office Action highlighted in bold on page 4 thereof. In response, the Applicants have amended each of the independent claims as discussed in the telephonic interview. The Applicants believe that this response satisfies all requirements for a Statement Of Substance Of The Interview. If the Examiner should believe that this statement is deficient in any respect, however, the Applicants respectfully request that the Examiner contact the undersigned attorney via telephone so that any perceived deficiency can be corrected.

The Applicants have also amended Dependent Claims 2-4, 7, 13-15, 19, 25-26, 29, 35-36, 40, 46-47, 50, 56-57, and 62 to conform with amendments of the independent Claims. The Applicants will show in the following remarks that all claims are patentable over the cited art. Reconsideration of the outstanding rejections and allowance of all claims is thus respectfully requested in due course. In the alternative, the Applicants respectfully request entry of all claim amendments as narrowing issues for further consideration on appeal.

Dependent Claim 65 Is Patentable As No Prior Art Rejections Have Been Applied To This Claim

Claim 65 is patentable because no rejections have been applied to this claim. Accordingly, the Applicants respectfully request allowance of Claim 65. Dependent Claim

65 has not been rewritten in independent form because the Applicants will show in the following remarks that Independent Claim 55 is patentable over the cited art.

Claims 1-2, 5-7, 9-13, 16-17, 19, 24, 27-29, 33-34, 37-38, 40, 45, 48-50, 54-55, 58-60, And 62 Are Patentable Over The Combination Of Joy And Spencer

Claims 1-2, 5-7, 9-13, 16-17, 19, 24, 27-29, 33-34, 37-38, 40, 45, 48-50, 54-55, 58-60, and 62 have been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Joy *et al.* "Advanced SEM Imaging" (hereinafter "Joy") in view of Spence *et al.* "Low Energy Point Reflection Electron Microscopy" (hereinafter "Spence"). These Claims are patentable over the combination of Joy and Spence for at least the reasons discussed in the Applicant's Amendment submitted on February 4, 2004.

Claim 1, for example, recites "A method for patterning a layer on a substrate with a desired projection image." (Underline added.) The method of Claim 1 includes:

> providing a reflector surface that has been patterned to include variation in a property thereof providing information that corresponds to the desired projection image;
>
> projecting a coherent beam of electrons toward the reflector surface so that a portion of the coherent beam of electrons is reflected off the reflector surface;
>
> projecting a portion of the coherent beam of electrons to the layer without reflecting off the reflector surface; and
>
> maintaining the substrate including the layer in the path of the reflected radiation and in the path of the portion of the coherent beam of electrons projected without reflecting off the reflector surface so that the reflected portions of the coherent beam of electrons and portions of the coherent beam of electrons projected without reflecting off the reflector surface interfere to provide a holographic projection of the desired projection image and so that the holographic projection of the desired projection image is projected onto the layer to thereby pattern the layer with the desired projection image. (Underline added.)

Claim 1 has thus been amended as discussed with the Examiner on May 23, 2005, and entry and allowance of Claim 1 is respectfully requested. Accordingly, the Applicants submit that Claim 1 is patentable over the Joy and Spence for the reasons discussed in the telephonic interview of May 23, 2005, and the reasons discussed below.

As discussed in the Applicants Amendment of February 4, 2005, both Joy and Spence relate to microscopes as evidenced for example by the titles: "Advanced SEM Imaging"

(where SEM is an acronym for Scanning Electron Microscope); and "Low Energy Point Reflection Electron Microscopy." (Underline added.) In particular, Figure 8 of Joy is a "Schematic layout of an advanced imaging system..." (Joy, page 659.) In Spence, Figure 1 illustrates a "Point projection microscope" (Spence, page 578); and Figure 3 illustrates "Principle of point reflection electron microscope" (Spence, page 580); and Figure 7 illustrates "Path differences for a phase shift at a step" (Spence, page 582). More generally, Spence reports "the first preliminary results from a new low voltage electron microscope...." (Spence, page 577.)

Accepting the characterization of the combination of Joy and Spence provided in the Final Office Action, for the sake or argument, capturing an image and/or measuring diffraction patterns fails to disclose or suggest patterning as recited in Claim 1. In particular, the Final Office Action states that:

> It would have been obvious ... to modify the process of Joy ...by using a microchannel plate detection means such as that taught by Spence ... with a reasonable expectation of capturing/resolving the desired diffraction image based upon the similarity of layout for the electron emitter tip and the scattering/reflection surface and the disclosure of measuring diffraction patterns in Spence....

Office Action, page 3. (Underline added.) Even accepting this characterization for the sake of argument, measuring diffraction patterns fails to teach or suggest patterning as recited in Claim 1.

As set forth in the Manual of Patent Examining Procedure (MPEP), three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references when combined must teach or suggest all the claim limitations. Moreover, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *See*, MPEP, Sec. 2143.

As discussed above, neither Joy or Spence, taken alone or in combination, teaches or suggests a method for patterning a layer on a substrate with a desired projection image wherein a reflector surface has been patterned to include variation in a property thereof providing information that corresponds to the desired projection image, and/or wherein a holographic projection of the desired projection image is projected onto the layer to thereby pattern the layer with the desired projection image. Accordingly, the prior art references do not teach or suggest all the claim limitations. Moreover, both Joy and Spence teach away from the recitations of Claim 1 because both Joy and Spence relate to microscopy. Accordingly, there is no motivation to combine Joy and Spence to somehow provide the method of Claim 1.

The Final Office Action appears to take the further position that the combination of Joy and Spence teaches or suggests methods and/or systems discussed with respect to the holographic microscope of Figure 1 of the present application. In particular, the Final Office Action states that:

> The applicant argues as if the use of image detectors, such as microchannel plate detectors, was not embraced by the claims. The examiner points to the instant specification [26 in the prepub] which specifically describes the use of CCD detectors which generate digital images and specifically describes the use of other detectors. The specification also points out that "Alternately or in addition, the controller can be used the amplitude and phase information to make measurements of particular features of the sample surface" [0027]. This clearly indicates that the embrace measurements of the topography of the reflector surfaces. When reading Joy et al. one skilled in the art would note that no detectors are disclosed and would look to other electron imaging processes which record diffraction (holograms are inherently diffractive) patterns, such as Spence et al., who clearly form and record Fresnel diffraction images, for detectors which would be useful in these processes when making and using the apparatus of Joy et al. to ensure a reasonable expectation of success. The applicant's pointing to the image analysis ignores the fact that this is specifically described in the instant specification as well as the specific discussion of the use of a "holographic microscope" in the instant specification [0031 in prepub]. ...

Final Office Action, pages 3-4. Accepting for the sake of argument that the combination of Joy and Spence does teach systems and/or methods discussed with respect to Figure 1 of the present Application, the Applicants respectfully submit that Claim 1 does not read on (i.e. does not "embrace") systems and/or methods discussed with respect to Figure 1 of the present

Application, and microscopy and/or imaging of Joy and/or Spence fails to teach or suggest patterning. As stated in the MPEP, the prior art references when combined must teach or suggest all the claim limitations (as opposed to unclaimed portions of the specification).

As discussed in the present Application, Figure 1 is a block diagram illustrating "a reflective holographic microscope" 31 and methods used "to characterize a sample surface" 41. (Application, paragraph 26.) In contrast to imaging or microscopy as discussed in Joy, Spence, and/or portions of the present Application relating to Figure 1, each of the pending claims recites a method or system "for patterning a layer on a substrate". In Claim 1, for example, "the reflector surface has been patterned to include variation in a property thereof providing information that corresponds to the desired projection image," and "the holographic projection of the desired projection image is projected onto the layer to thereby pattern the layer with the desired projection image." Patterning systems and methods supporting claimed embodiments of the present invention are discussed in portions of the present Application relating to Figures 8, 10, 11, and 12. Joy and Spence thus fail to teach or suggest patterning a layer on a substrate with a desired projection image, a reflector surface that has been patterned to include variation in a property thereof providing information that corresponds to the desired projection image, and/or a holographic projection of the desired projection image being projected onto the layer to thereby pattern the layer with the desired projection image.

For at least the reasons discussed above, the Applicants respectfully submit that Claim 1 is patentable over the combination of Joy and Spence. The Applicants further submit that Independent Claims 12, 24, 34, 45, and 55 are patentable over Joy and Spence for reasons similar to those discussed above with regard to Claim 1. In addition, Dependent Claims 2-11, 13-23, 25-33, 35-44, 46-54, and 56-66 are patentable over Joy and Spence at least as per the patentability of Claims 1, 12, 24, 34, 45, and 55 from which they depend.

Claims 1-7, 9-19, 24-29, 33-38, 40, 45-50, 54-60, And 62
Are Patentable Over The Combination Of Joy and Elliott

Claims 1-7, 9-19, 24-29, 33-38, 40, 45-50, 54-60, and 62 have been rejected under 35 U.S.C. Sec. 103(a) as being unpatentable over Joy in view of Elliott "Integrated Circuit Manufacturing Technology" (hereinafter "Elliott"). The Applicants respectfully submit that

all claims are patentable over the combination of Joy and Elliott for at least the reasons discussed below. While the previously cited Japanese Publication No. 11-329944 Tetsuo *et al.* reference (hereinafter "Tetsou") is not explicitly recited in the rejection, the Tetsou et al. reference is cited in the body of the rejection at the bottom of page 4 of the Office Action. Accordingly, the Applicants will also address the Tetsou reference.

Claim 1, for example, recites "A method for patterning a layer on a substrate with a desired projection image." The method of Claim 1 includes:

> providing a reflector surface that has been patterned to include variation in a property thereof providing information that corresponds to the desired projection image;
>
> projecting a coherent beam of electrons toward the reflector surface so that a portion of the coherent beam of electrons is reflected off the reflector surface;
>
> projecting a portion of the coherent beam of electrons to the layer without reflecting off the reflector surface; and
>
> maintaining the substrate including the layer in the path of the reflected radiation and in the path of the portion of the coherent beam of electrons projected without reflecting off the reflector surface so that the reflected portions of the coherent beam of electrons and portions of the coherent beam of electrons projected without reflecting off the reflector surface interfere to provide a holographic projection of the desired projection image and so that the holographic projection of the desired projection image is projected onto the layer to thereby pattern the layer with the desired projection image. (Underline added.)

Claim 1 has thus been amended as discussed with the Examiner on May 23, 2005, and entry and allowance of Claim 1 is respectfully requested. Accordingly, the Applicants submit that Claim 1 is patentable over the Joy, Elliot, and Tetsou for the reasons discussed in the telephonic interview of May 23, 2005, and the reasons discussed below. Among other reasons that Claim 1 is patentable over Joy, Elliot, and Tetsou, the Applicants respectfully submit that there is no motivation in any of the three references to provide a reflector surface that has been patterned to include variation in a property thereof providing information that corresponds to the desired projection image.

As discussed above, Joy discusses scanning electron microscope imaging as opposed to patterning as recited in Claim 1. Elliott fails to provide the missing teachings. More particularly, Elliott discusses resists "formulated for use with e-beam exposure" (Elliott, page

77), and Tetsuo discusses a structure in Figure 3 including Si substrate 31, Si oxide film 32, polysilane 33, and chemistry amplification type positive resist 34, (Tetsou, translation, page 3, paragraph 25) "to form a highly precise resist pattern, without a charge up arising" (Tetsou, translation, page 3, paragraph 30). Nothing in any of Joy, Elliot, and/or Tetsou, taken alone or in combination, however, teaches or suggests patterning as recited in Claim 1 where a holographic projection of a desired projection image is projected onto a layer to thereby pattern the layer with the desired projection image. In contrast, Joy discusses scanning electron microscopy and Elliott and Tetsou discuss electron beam resists without mention of holographic projection.

As discussed in Section 2143 of the Manual for Patent Examining Procedure, three basic criteria must be met to establish a *prima facia* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second there must be a reasonable expectation of success. Finally, the prior art references when combined must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. MPEP, Sec. 2143.

As discussed with the Examiner on May 23, 2005, there is no motivation in Joy, Elliot, and/or Tetsou to provide a reflector surface that has been patterned to include variation in a property thereof providing information that corresponds to a desired projection image. Joy relates to a device for imaging an unknown sample, and thus fails to provide motivation to provide a reflector surface that has been patterned to include variation in a property thereof providing information that corresponds to a desired projection image. While Elliot and Tetsou discuss resists for e-beam exposure, these references also fail to provide motivation to provide a reflector surface that has been patterned as set forth in Claim 1. Accordingly, there is no suggestion or motivation in the references or in the knowledge generally available to one or ordinary skill in the art, to modify or combine reference teachings to teach or suggest providing a reflector surface that has been patterned as set forth in Claim 1, and Claim 1 is thus patentable.

Moreover, the Applicants respectfully submit that there is no suggestion or motivation in the references or in the knowledge generally available to one or ordinary skill in the art to modify the scanning electron microscope of Joy to include a resist of either Elliott and/or Tetsuo as a detector. More particularly, there is no suggestion or motivation to use a resist of either Elliott and/or Tetsuo together with or in place of a backscattered electron detector of Joy. Moreover, if a resist of either Elliott and/or Tetsuo were used together with or in place of a backscattered electron detector of a scanning electron microscope of Joy, the Applicants respectfully submit that such a combination would not be expected to succeed. Instead, the use of a resist in the scanning electron microscope of Joy would reasonably be expected to result in failure of the scanning electron microscope as opposed to patterning a layer with a desired projection image.

The Applicants note that the Final Office Action states that: "It would have been obvious ... to modify the process of Joy ...using photoresists or oxidizable silicon layers as detection means as taught by Elliot ... or Tetsou ... with a reasonable expectation of capturing/resolving the desired diffraction image based upon the disclosure of the use of these means in the art for detection of electrons." As discussed above, the use of a photoresist from Tetsou and/or Elliott in the scanning electron microscope of Joy would not be reasonably expected to succeed.

The Final Office Action further states that electron resists are old and well known in the art as useful for electron imaging. The Applicants agree that electron resists are known. The Applicants respectfully submit, however, that the combination of Joy, Elliot, and Tetsou fails to teach or suggest patterning as recited in Claim 1 where a reflector surface has been patterned to include variation in a property thereof providing information that corresponds to a desired projection image, and where a holographic projection of the desired projection image is projected onto the layer to thereby pattern the layer with the desired projection image. As discussed in Joy at column 1, on page 659 the scanning electron microscope (SEM) includes "video amplifiers, detectors, and display systems." Substitution of a resist or other layer of Elliot and/or Tetsou for a detector of Joy would result in non-functionality of the scanning electron microscopy of Joy. More particularly, a resist or other layer of Elliot

and/'or Tetsou cannot be reasonably be expected to operate with video amplifiers and/or display systems to provide an operational scanning electron microscope.

For at least these reasons, the Applicants respectfully submit that Claim 1 is patentable over the combination of Joy and/or Elliott. The Applicants further submit that Independent Claims 12, 24, 34, 45, and 55 are also patentable over the combination of Joy, Elliott, and Tetsou for reasons similar to those discussed above with regard to Claim 1. In addition, Dependent Claims 2-11, 13-23, 25-33, 35-44, 46-54, and 56-65 are patentable over the combination of Joy, Elliot, and Tetsou at least as per the patentability of Claims 1, 12, 24, 34, 45, and 55 from which they depend.

Claims 35 and 36 Are Separately Patentable

Claims 35 and 36 are patentable over Joy, Spence, Elliot, and/or Tetsou, for the reasons discussed above. Claims 35 and 36 are also patentable for at least the additional reasons discussed below.

Claim 35, for example, recites that "the layer comprises an oxide layer that is activated on exposure to portions of the holographic projection of the desired projection image having sufficient intensity, so that the activated portions of the oxide layer can be selectively removed, maintained, or modified." Similar recitations are included in Claim 36 which recites that "the layer comprises a silicon layer that is activated on exposure to portions of the holographic projection of the desired projection image having sufficient intensity, so that activated portions of the silicon layer can be selectively oxidized or modified."

The Applicants respectively submit that Joy, Spencer, Elliot, and/or Tetsuo, taken alone or in combination fails to teach or suggest a silicon layer or a silicon oxide layer that is activated on exposure to portions of a holographic projection having sufficient intensity so that activated portions can be selectively removed, maintained, modified, and/or oxidized. As discussed above, Joy relates to microscope imaging as opposed to patterning; Spencer discusses a positive-working photoresist (see, Spencer, col. 4, line 14); and Elliott and Tetsuo discuss patterning of electron beam resists. None of the cited references, however, discloses

or suggests oxide or silicon layers that are activated on exposure to portions of a holographic projection.

Accordingly, Joy, Spencer, Elliott, and/or Tetsuo fails to disclose or suggest the recitations of Claims 35 and 36, and Claims 35 and 36 are thus separately patentable.

Dependent Claim 9 Is Separately Patentable

Dependent Claim 9 is patentable over the combination of Joy, Spence, Elliot, and/or Tetsuo for the reasons discussed above. Dependent Claim 9 is also patentable for at least the additional reasons discussed blow. Dependent Claim 9 recites projecting two beams of coherent radiation toward a reflector surface. The Applicants respectfully submit that none of the cited references teaches or suggests projecting two beams of coherent radiation. Accordingly, the Applicants respectfully submit that Claim 9 is separately patentable over the cited art.

Dependent Claims 10 And 65 Are Separately Patentable

Dependent Claims 10 and 65 are patentable over the combination of Joy, Spence, Elliot, and/or Tetsuo for the reasons discussed above. Dependent Claims 10 and 65 are also separately patentable for at least the additional reasons discussed blow. Dependent Claim 10, for example, recites projecting coherent radiation toward a second reflector surface to provide a second holographic projection of reflected radiation. The Applicants respectfully submit that none of the cited references teaches or suggests a second reflector. Accordingly, the Applicants respectfully submit that Claims 10 and 65 are separately patentable over the cited art.

CONCLUSION

The Applicants sincerely appreciate the Examiner's thorough examination of this application. In response, the Applicants submit that all rejections have been overcome and that all pending claims in the present application are in condition for allowance for at least the reasons discussed above. A Notice of Allowance is thus respectfully requested in due course.

The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop AF; Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 6, 2005.

Joyce Paoli
Date of Signature: June 6, 2005